

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-082723

(43)Date of publication of application : 30.03.2001

(51)Int.Cl.

F23G 7/06  
F23G 5/44

(21)Application number : 2000-096599

(71)Applicant : NIPPON SANSO CORP

(22)Date of filing : 31.03.2000

(72)Inventor : NAKAJIMA AKIKO  
KOSEKI SHUICHI  
ENDOU FUMIYOSHI

(30)Priority

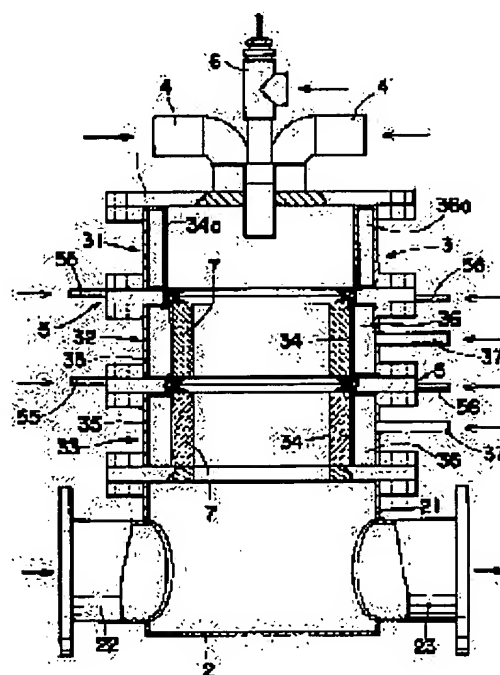
Priority number : 11200589 Priority date : 14.07.1999 Priority country : JP

(54) COMBUSTION TYPE NOXIOUS SUBSTANCE REMOVING DEVICE AND BURNER FOR COMBUSTION TYPE NOXIOUS SUBSTANCE REMOVING DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a combustion noxious substance removing device to remove various noxious gases with high-efficiency for a long time and to provide a burner to form an effective flame for combustion noxious substance removal and facilitate cleaning of a nozzle part.

**SOLUTION:** This device comprises a combustion cylinder 3 to close one end by a cover body and have the other end opening connected to a cooling cylinder 2; a gas to be treated introduction nozzle 4 situated at the cover body; and a pilot burner 6; and a main burner 5 to effect combustion and/or thermal decomposition of gas to be treated. The main burner 5 is an annular body provided on an inner peripheral surface with a fuel gas injection nozzle and an injection nozzle for assisting gas necessary for fuel combustion. The combustion cylinder 3 consists of axially disposed peripheral wall bodies 31-33, and the main burner 5. The peripheral wall bodies 32 and 33 have an inner wall 34 formed of a porous material, a feed pipe 37 for combustion assisting gas for oxidation is connected to an outer wall 35, and combustion assisting gas for oxidizing gas to be treated is injected in a combustion cylinder through the inner wall 34.



## LEGAL STATUS

[Date of request for examination] 29.05.2000

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the  
examiner's decision of rejection or application  
converted registration]

[Date of final disposal for application]

[Patent number] 3460122

[Date of registration] 15.08.2003

[Number of appeal against examiner's decision of  
rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**CLAIMS**

---

**[Claim(s)]**

[Claim 1] The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. Said main burner Are the annular solid which formed the V character-like circumferential groove in inner skin, and while forms the circumferential groove of the shape of this V character. To a field said fuel gas jet nozzle Combustion equation damage elimination equipment which said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion carries out opening to the field of another side, respectively, and is characterized by the nozzle shaft of both the jet nozzle crossing within a combustion cylinder.

[Claim 2] The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. Said main burner It is the annular solid which has a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion in inner skin. Combustion equation damage elimination equipment characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion.

[Claim 3] The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. Said main burner It is the annular solid which has a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion in inner skin. Said combustion cylinder It is formed by the peripheral wall object arranged in shaft orientations, and said main burner. Rather than this main burner at least a down-stream peripheral wall object In the outer wall of the peripheral wall object which was formed in the double-frame construction which has the wall formed with the porous material, and was formed in this double-frame construction Combustion equation damage elimination equipment characterized by connecting the susceptibility-of-substances-to-burn nature gas supply line for oxidation which supplies the susceptibility-of-substances-to-burn nature gas for processed gas oxidation which blows off in a combustion cylinder through said wall between said double walls.

[Claim 4] Said main burner is combustion equation damage elimination equipment according to claim 3 characterized by in while inner skin being formed in a V character-like circumferential groove and forming the circumferential groove of the shape of this V character for said fuel gas jet nozzle making it a field, for said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion making opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle crossing within a combustion cylinder.

[Claim 5] Combustion equation damage elimination equipment according to claim 3 or 4 characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion of said main burner.

[Claim 6] It is combustion equation damage elimination equipment according to claim 3 characterized by being the structure where said susceptibility-of-substances-to-burn nature gas for processed gas oxidation is not supplied in a

combustion cylinder rather than the main burner of said combustion cylinder, as for the peripheral wall object of the upstream.

[Claim 7] The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is the burner used as said main burner of combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. Consist of an annular solid by which the V character-like circumferential groove was formed in inner skin, and while forms the circumferential groove of the shape of this V character. To a field a fuel gas jet nozzle The burner for combustion equation damage elimination equipments which the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion carries out opening to the field of another side, respectively, and is characterized by the nozzle shaft of both the jet nozzle crossing within said combustion cylinder.

[Claim 8] The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, While being the burner used as said main burner of combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner and having a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion The burner for combustion equation damage elimination equipments characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to this susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**DETAILED DESCRIPTION**

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the burner which has suitable structure to use as Seki, then a main burner of such [ both ] combustion equation damage-elimination equipment at the equipment which carries out damage-elimination processing by combustion or the pyrolysis, and defangs in detail the non-flammable gas which affects harmful gas and earth environment, such as toxic gas contained in the exhaust gas discharged from the manufacturing installation of a semi-conductor or LCD, corrosive gas, inflammable gas, and susceptibility-of-substances-to-burn nature gas, about the burner for combustion equation damage-elimination equipment and combustion equation damage-elimination equipments.

[0002]

[Description of the Prior Art] In the exhaust gas discharged from an industrial process, for example, a semi-conductor and a LCD manufacturing installation, since harmful gas, such as toxic gas, corrosive gas, and inflammable gas, is contained, after performing damage elimination (defanging) processing of these injurious ingredients, it is necessary to discharge exhaust gas. Combustion equation damage elimination equipment is known as one of the equipment for such eliminating exhaust gas.

[0003] This combustion equation damage elimination equipment burns the various injurious ingredients contained in the exhaust gas introduced in the combustion cylinder with the flame of a main burner within a combustion cylinder, or carries out a pyrolysis, and performs damage elimination processing, and that example is indicated by JP,10-110926,A. The main burner of the combustion equation damage elimination equipment currently indicated by this official report The processed gas nozzle which spouts said exhaust gas, and the lift gas nozzle which spouts inert gas, The susceptibility-of-substances-to-burn nature gas nozzle for processed gas combustion which spouts the susceptibility-of-substances-to-burn nature gas which burns the inflammable component in said exhaust gas, It is the multiplex juxtaductal type burner which formed concentrically in order the susceptibility-of-substances-to-burn nature gas nozzle for fuel gas combustion which spouts the susceptibility-of-substances-to-burn nature gas which burns fuel gas, and the fuel gas nozzle which spouts fuel gas ranging from the core to a periphery.

[0004]

[Problem(s) to be Solved by the Invention] Since combustion equation damage elimination equipment equipped with this illustrated multiplex juxtaductal type burner was aimed at the gas which is [ nature / inflammability or / susceptibility-of-substances-to-burn ] easy to burn, combustion processing was carried out below at threshold limit value, and the extremely flammable harmful gas of SiH<sub>4</sub> grade was able to be defanged. However, it became clear that the noncombustible and fire-resistant gas with the high decomposition temperature which affects the earth environment of C<sub>2</sub>F<sub>6</sub> grade could hardly carry out decomposing combustion.

[0005] Then, this invention aims at offering the combustion equation damage elimination equipment which can carry out decomposing combustion of the non-flammable gas which the combustion processing of the inflammable harmful gas of SiH<sub>4</sub> grade and the susceptibility-of-substances-to-burn nature harmful gas of NF<sub>3</sub> grade can be carried out below at threshold limit value, and affects the earth environment of C<sub>2</sub>F<sub>6</sub> grade. Moreover, this invention prevents adhesion in the combustion cylinder inside of products of combustion, and aims at the ability to perform combustion processing over long duration. Furthermore, this invention aims at offering the burner which can set to combustion equation damage elimination equipment, can be made to be able to burn and/or decompose various injurious ingredients, and can form the suitable flame for \*\*.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the combustion equation damage

elimination equipment of this invention The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. The 1st configuration Said main burner is the annular solid which formed the V character-like circumferential groove in inner skin. It is characterized by in while forming the circumferential groove of the shape of this V character, for said fuel gas jet nozzle making it a field, for said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion making opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle crossing within a combustion cylinder.

[0007] Moreover, said main burner in damage elimination equipment is the annular solid which has a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion in inner skin, and the 2nd configuration of the combustion equation damage elimination equipment of this invention is characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion.

[0008] The combustion cylinder by which an end is blockaded a lid and other end opening opens the 3rd configuration of this invention for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. Said main burner It is the annular solid which has a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion in inner skin. Said combustion cylinder It is formed by the peripheral wall object arranged in shaft orientations, and said main burner. Rather than this main burner at least a down-stream peripheral wall object In the outer wall of the peripheral wall object which was formed in the double-frame construction which has the wall formed with the porous material, and was formed in this double-frame construction It is characterized by connecting the susceptibility-of-substances-to-burn nature gas supply line for oxidation which supplies the susceptibility-of-substances-to-burn nature gas for processed gas oxidation which blows off in a combustion cylinder through said wall between said double walls.

[0009] Furthermore, in the 3rd configuration of the above, inner skin is formed in a V character-like circumferential groove for said main burner. It is what in while forming the circumferential groove of the shape of this V character said fuel gas jet nozzle makes it a field, said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion makes opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle intersects within a combustion cylinder, The nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion of said main burner is formed, The peripheral wall object of the upstream is characterized by being the structure where said susceptibility-of-substances-to-burn nature gas for processed gas oxidation is not supplied in a combustion cylinder rather than the main burner of said combustion cylinder. Furthermore, said susceptibility-of-substances-to-burn nature gas for processed gas oxidation has the mixed gas of air, air, and oxygen, or desirable either of oxygen gas, and, as for said fuel gas, it is desirable that they are either a hydrocarbon or hydrogen gas.

[0010] Moreover, the burner for combustion equation damage elimination equipments of this invention The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is a suitable burner to use as said main burner of combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. It is characterized by in while consisting of an annular solid by which the V character-like circumferential groove was formed in inner skin and forming the circumferential groove of the shape of this V character, for a fuel gas jet nozzle making it a field, for the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion making opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle crossing within said combustion cylinder.

[0011] Furthermore, other configurations of the burner for combustion equation damage elimination equipments are characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to this susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion while they are equipped with a fuel gas jet nozzle and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion.

[0012]

[Embodiment of the Invention] Hereafter, the example of the 1st gestalt of this invention is explained in more detail based on drawing 1 thru/or drawing 5. The principle of this invention introduces processed gas soon into an elevated-temperature flame, and are combustion and/or a thing which carries out decomposing combustion.

[0013] The combustion cylinder 3 which an end (upper limit) is blockaded with a lid 1, and other end (lower limit) opening opens for free passage in a cooling dome 2 as the combustion equation damage elimination equipment concerning this example of a gestalt is shown in drawing 1, The processed gas installation nozzle 4 which is attached in said lid 1 and introduces processed gas (for example, exhaust gas discharged from the manufacturing installation of a semi-conductor or LCD) in the combustion cylinder 3, It has the main burner 5 which forms the flame for burning and/or pyrolyzing processed gas within said combustion cylinder 3, and the pilot burner 6 which it is attached [ pilot burner ] in the core of said lid 1, and lights this main burner 5.

[0014] As said main burner 5 is shown in drawing 2 and drawing 3, it is the annular solid by which inner skin was formed in the V character-like circumferential groove, and the nozzle shaft of both the jet nozzles 51 and 52 crosses within the combustion cylinder 3 while while forming the circumferential groove of the shape of this V character is turned in the direction of a core of this burner 5 by the fuel gas jet nozzle's 51 making it a field, and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion making opening to the field of another side, respectively. Moreover, although what is necessary is not to restrict especially the path and number of both the jet nozzles 51 and 52, and for a heating value required for combustion of processed gas just to determine them, 72 holes of both jet nozzles 51 and 52 of this example of a gestalt are formed in the hoop direction each by the regular intervals of 5 times. Furthermore, the jet nozzles 51 and 52 are open for free passage, respectively in the annular space sections 53 and 54 formed in this burner 5. In the annular space section 53, the fuel gas supply pipe 55 is open for free passage, and the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion is open for free passage in the annular space section 54, respectively.

[0015] As fuel gas supplied from said fuel gas supply pipe 55, a hydrocarbon like LPG and hydrogen gas are used and the mixed gas of air, air, and oxygen gas or either of oxygen gas is used as susceptibility-of-substances-to-burn nature gas supplied from said susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion. By crossing being taken and spread toward the direction core of a path in the combustion cylinder 3, it mixes efficiently, and the susceptibility-of-substances-to-burn nature gas spouted from the fuel gas and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion which are spouted from said fuel gas jet nozzle 51 lights by the pilot flame of a pilot burner 6, and forms the plane elevated-temperature flame which crosses the inside of the combustion cylinder 3 in the direction of a path. Since processed gas surely crosses a flame by forming such a plane flame, positive combustion and/or a positive pyrolysis can be performed.

[0016] In addition, although the inner skin of a main burner 5 was formed in the V character-like circumferential groove, and the fuel gas jet nozzle 51 and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion were formed in this example of a gestalt so that each nozzle shaft might cross Inner skin is formed in a plane, you may make it form the fuel gas jet nozzle 51 and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion in parallel with the direction of a burner core, and it is good for the method of outside also as a curved surface of a convex. Thus, by preparing so that fuel gas and the susceptibility-of-substances-to-burn nature gas for fuel combustion may be spouted from a respectively different nozzle, when it is going to obtain a high calory, even if the oxygen density in susceptibility-of-substances-to-burn nature gas is high, a backfire happens and is safe. Moreover, although there is no limit in the use number of a main burner 5, it is desirable to prepare two or more pieces for the improvement in combustion efficiency.

[0017] The mixed gas of LPG (fuel gas) and air (susceptibility-of-substances-to-burn nature gas) is supplied to said pilot burner 6. Moreover, a pilot burner 6 is set up so that the tip of the pilot flame may reach the installation level location of a main burner 5. That what is necessary is just to be, in this example of a gestalt, four all are prepared by said one or more processed gas installation nozzles 4, although not illustrated.

[0018] Said combustion cylinder 3 is formed by three peripheral wall objects 31, 32, and 33 arranged toward the other end (from the upstream to the downstream) from the end, and the main burners 5 and 5 \*\*\*\*(ed) between the peripheral wall object 31 and 32 and between the peripheral wall object 32 and 33.

[0019] From the main burner 5 of the upstream, the peripheral wall objects 32 and 33 of the downstream As shown in drawing 4 and drawing 5, it is the porous material with which the susceptibility-of-substances-to-burn nature gas for processed gas oxidation passes a wall 34, for example, the coaxial double-frame construction formed with the sintered metal. In an outer wall 35 In order to make the susceptibility-of-substances-to-burn nature gas for processed gas oxidation blow off in the combustion cylinder 3 through a wall 34, the susceptibility-of-substances-to-burn nature gas



supply line 37 for oxidation for supplying this susceptibility-of-substances-to-burn nature gas to 36 between said double walls is connected. Thus, adhesion in the wall 34 of SiO<sub>2</sub> powder which the susceptibility-of-substances-to-burn nature gas for processed gas oxidation used as the oxidation gas combustion of SiH<sub>4</sub> and for the decomposing combustion of C<sub>2</sub>F<sub>6</sub> blows off through this wall 34, for example, is generated by combustion of SiH<sub>4</sub> is prevented by forming the wall 34 of the peripheral wall objects 32 and 33 with a porous material.

[0020] Moreover, when becoming beyond the heat-resistant temperature of the porous material which the temperature of a wall 31 is using for a wall 34 by combustion of a main burner 5, you may also include the heat-insulating element 7 which consists of heat-resistant porous materials, such as ceramic form, like this example of a gestalt inside a wall 34. As for said susceptibility-of-substances-to-burn nature gas for processed gas oxidation, air, air and the mixed gas of oxygen gas, or either of oxygen gas is used. In addition, the baffle for the susceptibility-of-substances-to-burn nature gaseous diffusion for processed gas oxidation in 38 and 39 are the ports for thermometries in the combustion cylinder 3.

[0021] Since the peripheral wall object 31 between the main burners 5 of the upstream which adjoins said lid 1 and this lid 1 most is arranged in the location before the processed gas introduced in the combustion cylinder 3 touches the flame of a main burner 5, there is little growth of SiO<sub>2</sub> powder and there is also little adhesion of the powder to an internal surface, for example. For this reason, the peripheral wall object 31 can be made into the structure where said susceptibility-of-substances-to-burn nature gas for processed gas oxidation is not supplied in the combustion cylinder 3. That is, wall 34a may be the double-frame construction formed with the usual metal like single wall structure or this example of a gestalt.

[0022] In addition, if oxygen gas is contained in processed gas, for example, it is contained in processed gas for example, SiH<sub>4</sub> burns within the processed gas installation nozzle 4, and SiO<sub>2</sub> powder carries out accretion at the tip of this nozzle 4. In such a case, you may make it prevent adhesion of SiO<sub>2</sub> powder to the tip of a nozzle 4 by constituting wall 34a from porous materials, such as a sintered metal, supplying inert gas to 36 between double walls a, and making inert gas blow off from porous wall 34a in the combustion cylinder 3.

[0023] The other end of the combustion cylinder 3 is connected to up opening of the cooling room 21 of the shape of a cylinder like object with base of a cooling dome 2. This cooling dome 2 had said cooling room 21, the coolant gas installation tubing 22 linked to the peripheral wall of this cooling room 21, and the processed gas exhaust pipe 23 connected with this introductory tubing 22 at the peripheral wall which counters, and this exhaust pipe 23 has connected for example, processed gas to a scrubber (not shown), such as carrying out washing processing. Said combustion cylinder 3 is formed so that the coolant gas flow direction of a cooling dome 2 and the shaft orientations may cross at right angles.

[0024] And the processed gas introduced in the combustion cylinder 3 By the suction effect of the blower (not shown) connected to the processed gas exhaust pipe 23 side Flow the inside of the combustion cylinder 3 toward a cooling dome 2, and the plane elevated-temperature flame of a main burner 5 is passed in the meantime. It burns and/or pyrolyzes, and the cooling air which flowed in the cooling room 21 from the coolant gas installation tubing 22 by said suction effect is joined, it is cooled, and the injurious ingredient in processed gas is discharged with cooling air from the processed gas exhaust pipe 23.

[0025] Drawing 6 is drawing of longitudinal section of combustion equation damage elimination equipment about the example of the 2nd gestalt of this invention. In addition, in the following explanation, the same sign is given to the same component as the component of said example of the 1st gestalt, and detailed explanation is omitted.

[0026] The combustion cylinder 3 shown in this example of a gestalt is formed like said example of a gestalt with two main burners 5 and 5 and three peripheral wall objects 38 established so that this main burner 5 might be pinched. Each peripheral wall object 38 is formed in the interior by the double-frame construction which has gas-passageway 38a, and the coolant gas installation tubing 39 and a coolant gas delivery tube (not shown) are connected to the peripheral wall outside-of-the-body wall, respectively. He is trying for this peripheral wall object 38 to prevent the temperature rise of a peripheral wall inside-of-the-body wall by introducing gas, such as air, into gas-passageway 38a from the coolant gas installation tubing 39, and deriving from a coolant gas delivery tube.

[0027] Moreover, use said susceptibility-of-substances-to-burn nature gas as coolant gas, it is introduced into gas-passageway 38a, and a temperature up is carried out by heat exchange with a peripheral wall inside-of-the-body wall. By supplying the hot coolant gas drawn from the coolant gas delivery tube to said susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion, and making it blow off from the susceptibility-of-substances-to-burn nature blow-off-gas nozzle 52 for fuel combustion of said main burner 5 The flame temperature of a main burner 5 can be raised and more effective combustion damage elimination can be performed.

[0028] Furthermore, in the main burner 5 shown in this example of a gestalt, the nozzle penetrant remover supply pipe



57 which supplies a nozzle penetrant remover to said susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion which supplies susceptibility-of-substances-to-burn nature gas is connected to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion. A nozzle penetrant remover is for flushing the powder of SiO<sub>2</sub> grade adhering to the nozzle section of a main burner 5, for example, can choose liquids, such as water and an alkali water solution, according to the description of an affix.

[0029] Thus, even if powder adheres to the inner skin and the nozzle point of a main burner 5 in operation of long duration by connecting the nozzle penetrant remover supply pipe 57 By closing valve 56V of the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion, opening valve 57V of the nozzle penetrant remover supply pipe 57, and supplying a nozzle penetrant remover to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion Washing removal of the powder adhering to the inner skin of a main burner 5 can be carried out without disassembling the combustion cylinder 3. Thereby, the cost which maintenance takes can be reduced sharply. Moreover, it is easily applicable also to existing combustion equation damage elimination equipment only by extension of piping.

[0030] After washing by the nozzle penetrant remover, Valves 56V and 57V are switched. Susceptibility-of-substances-to-burn nature gas to the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion In addition, a sink, Although what is necessary is just to discharge a nozzle penetrant remover from the inside of the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion, when expensive gas like oxygen gas as susceptibility-of-substances-to-burn nature gas is being used The purge gas installation tubing 58 which prepared valve 58V is connected to the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion. Gas cheap as purge gas, for example, the compressed air etc., from this purge gas installation tubing 58 by the high-speed style Or by supplying at an elevated temperature, a nozzle penetrant remover can be purged economically and efficiently. Moreover, it can also be made to blow off, where a penetrant remover, air, etc. are mixed.

[0031] Moreover, although it is possible also for connecting with the fuel gas supply pipe 55, when safety is taken into consideration, it is desirable [ such a nozzle penetrant remover supply pipe ] to connect with the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion as mentioned above.

[0032]

[Example] The combustion equation damage elimination equipment of a configuration of being shown in example 1 drawing 1 -5 was used. A main burner 5 is a product made from stainless steel with the outer diameter of 350mm, a bore [ of 155mm ], and a thickness of 16mm, and is carrying out the shape of an anchor ring. the aperture of the fuel gas jet nozzle 51 of this burner 5 -- 1.6mm -- it is -- the aperture of the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion -- 2.2mm -- it is -- a hole -- numbers are 72 holes each. Moreover, the nozzle shaft of both the jet nozzles 51 and 52 leans 5 times to the horizontal plane, respectively so that the include angle of the V character slot of a ring main jet side may cross within the combustion cylinder 3 at 40 degrees.

[0033] It is the double-frame construction to which the peripheral wall objects 32 and 33 of the downstream used the sintered metal made from stainless steel with an outer diameter [ of 200mm ], and a thickness of 3mm for wall 3e, and used stainless steel with an outer diameter of 267.4mm for 3f of outer walls from the main burner of the upstream, and the die length of each peripheral wall objects 32 and 33 is 84mm. Moreover, inside the sintering metal wall 34, ceramic form (Bridgestone Make) with an outer diameter [ of 200mm ] and a bore of 150mm was included as a heat-insulating element 7. The peripheral wall object 31 located in the upstream from the main burner 5 of the upstream is the double-frame construction which used the outer diameter of 267.4mm, and 216.3mm stainless steel for outer wall and wall 34a, respectively.

[0034] The outer diameter of 267.4mm, the bore of 260.6mm, height of 170mm, the coolant gas installation tubing 22, and the processed gas exhaust pipe 23 were 110.1mm in the outer diameter of 114.3mm, and bore, the flow rate of the cooling air of a cooling dome 2 was set into 16000l/m, and the cooling room 21 of a cooling dome 2 set the rate of flow to per second 28m.

[0035] The pilot burner 6 used PP-2-L of Naigai Co., Ltd., and LPG (fuel gas) 3l. [ /m ] and air (susceptibility-of-substances-to-burn nature gas for fuel combustion) 62.5l./m carried out mixed-gas supply, and it lit this pilot burner with the attached spark rod.

[0036] While the processed gas installation nozzle 4 supplies N<sub>2</sub> [ 50l./m ], N<sub>2</sub> [ i.e., ] of 200l./m of sum totals, to each nozzle 4 and introduces them into it in the combustion cylinder 3, using a thing with an outer diameter of 42.7mm four Air (susceptibility-of-substances-to-burn nature gas for processed gas [ powder antisticking-cum-] oxidation to a wall) 300l./m is supplied to 36 between the double walls of the peripheral wall objects 32 and 33 by reference condition (0-degree-C, one atmospheric pressure) conversion, respectively. Alike, respectively two main burners 5 and 5 after carrying out aeration into the combustion cylinder 3 through a wall 36 and a heat-insulating element 7 -- with LPG (fuel

gas) 10l./m The mixed gas (susceptibility-of-substances-to-burn nature gas for fuel combustion) which consists of air 133l. [/m ] and oxygen 14l./m was supplied, respectively, and was lit by the pilot burner 6.

[0037] Then, when N<sub>2</sub> of the processed gas installation nozzle 4 was changed to N<sub>2</sub> gas which contains SiH<sub>4</sub> 2%, was supplied every 50l./m a total of 200l. and carried out continuous-combustion processing for 8 hours, SiH<sub>4</sub> concentration in the other end outlet section of the combustion cylinder 3 was always below threshold limit value (5 ppm). Moreover, after the combustion processing halt, when the overhaul of the combustion cylinder 3 was carried out, adhesion of the processed gas installation nozzle section and SiO<sub>2</sub> powder to a wall was not seen.

[0038] In the same equipment as example 2 example 1, and the same utility conditions, when introducing 200l./m of every 50l./m sum totals and carrying out combustion processing of the N<sub>2</sub> gas which contains NF<sub>3</sub> 2% as processed gas, NF<sub>3</sub> concentration in the outlet section of the combustion cylinder 3 was below threshold limit value (10 ppm).

[0039] In the same equipment as example 3 example 1, and the same utility conditions, when introducing 200l./m of every 50l./m sum totals and carrying out decomposing combustion processing of the N<sub>2</sub> gas which contains C<sub>2</sub>F<sub>6</sub> 2% as processed gas, the cracking severity in this equipment was 97% or more.

[0040] Except having connected the nozzle penetrant remover supply pipe 57 to the susceptibility-of-substances-to-burn nature gas supply line 56 for example 4 fuel combustion, it was the same equipment as an example 1, and conditions, and after performing combustion processing of SiH<sub>4</sub> continuously for 168 hours, when the interior of the combustion cylinder 3 was checked, SiO<sub>2</sub> powder had adhered to the nozzle point of a main burner 5 by the thickness of about 5mm. Tap water was supplied from the nozzle penetrant remover supply pipe 57 in the condition of this as, and it was made to blow off from the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion for 10 minutes. Consequently, SiO<sub>2</sub> powder of a nozzle point was removable.

[0041]

[Effect of the Invention] Since the plane flame which crosses a combustion cylinder is formed according to this invention as explained above, the combustion processing of inflammable harmful gas and the susceptibility-of-substances-to-burn nature harmful gas can be carried out efficiently below at threshold limit value, and the decomposing combustion of the non-flammable gas can be carried out efficient, and the discharge of the harmful gas which affects earth environment can be stopped to the minimum. Furthermore, washing of a nozzle point can be easily performed by supplying a nozzle penetrant remover, without disassembling equipment. Moreover, adhesion of the generation powder to a combustion cylinder inside is prevented, and combustion processing stabilized over the long period of time can be performed.

[0042] Furthermore, the burner of this invention used as a main burner can form the superficial flame of the direction which crosses a combustion cylinder, and can perform positive combustion damage elimination processing. Moreover, since it is a diffusive-burning type, even if oxygen contains at high concentration in the susceptibility-of-substances-to-burn nature gas for fuel combustion, a backfire does not happen but combustion processing can be carried out at insurance. In addition, even if powder adheres to a nozzle point by establishing the nozzle penetrant remover supply path which supplies a nozzle penetrant remover, it can remove easily, without disassembling equipment.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

TECHNICAL FIELD

---

[Field of the Invention] This invention relates to the burner which has suitable structure to use as Seki, then a main burner of such [ both ] combustion equation damage-elimination equipment at the equipment which carries out damage-elimination processing by combustion or the pyrolysis, and defangs in detail the non-flammable gas which affects harmful gas and earth environment, such as toxic gas contained in the exhaust gas discharged from the manufacturing installation of a semi-conductor or LCD, corrosive gas, inflammable gas, and susceptibility-of-substances-to-burn nature gas, about the burner for combustion equation damage-elimination equipment and combustion equation damage-elimination equipments.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**PRIOR ART**

---

[Description of the Prior Art] In the exhaust gas discharged from an industrial process, for example, a semi-conductor and a LCD manufacturing installation, since harmful gas, such as toxic gas, corrosive gas, and inflammable gas, is contained, after performing damage elimination (defanging) processing of these injurious ingredients, it is necessary to discharge exhaust gas. Combustion equation damage elimination equipment is known as one of the equipment for such eliminating exhaust gas.

[0003] This combustion equation damage elimination equipment burns the various injurious ingredients contained in the exhaust gas introduced in the combustion cylinder with the flame of a main burner within a combustion cylinder, or carries out a pyrolysis, and performs damage elimination processing, and that example is indicated by JP,10-110926,A. The main burner of the combustion equation damage elimination equipment currently indicated by this official report The processed gas nozzle which spouts said exhaust gas, and the lift gas nozzle which spouts inert gas, The susceptibility-of-substances-to-burn nature gas nozzle for processed gas combustion which spouts the susceptibility-of-substances-to-burn nature gas which burns the inflammable component in said exhaust gas, It is the multiplex juxtaductal type burner which formed concentrically in order the susceptibility-of-substances-to-burn nature gas nozzle for fuel gas combustion which spouts the susceptibility-of-substances-to-burn nature gas which burns fuel gas, and the fuel gas nozzle which spouts fuel gas ranging from the core to a periphery.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

EFFECT OF THE INVENTION

---

[Effect of the Invention] Since the plane flame which crosses a combustion cylinder is formed according to this invention as explained above, the combustion processing of inflammable harmful gas and the susceptibility-of-substances-to-burn nature harmful gas can be carried out efficiently below at threshold limit value, and the decomposing combustion of the non-flammable gas can be carried out efficient, and the discharge of the harmful gas which affects earth environment can be stopped to the minimum. Furthermore, washing of a nozzle point can be easily performed by supplying a nozzle penetrant remover, without disassembling equipment. Moreover, adhesion of the generation powder to a combustion cylinder inside is prevented, and combustion processing stabilized over the long period of time can be performed.

[0042] Furthermore, the burner of this invention used as a main burner can form the superficial flame of the direction which crosses a combustion cylinder, and can perform positive combustion damage elimination processing. Moreover, since it is a diffusive-burning type, even if oxygen contains at high concentration in the susceptibility-of-substances-to-burn nature gas for fuel combustion, a backfire does not happen but combustion processing can be carried out at insurance. In addition, even if powder adheres to a nozzle point by establishing the nozzle penetrant remover supply path which supplies a nozzle penetrant remover, it can remove easily, without disassembling equipment.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**TECHNICAL PROBLEM**

---

[Problem(s) to be Solved by the Invention] Since combustion equation damage elimination equipment equipped with this illustrated multiplex juxtaductal type burner was aimed at the gas which is [ nature / inflammability or / susceptibility-of-substances-to-burn ] easy to burn, combustion processing was carried out below at threshold limit value, and the extremely flammable harmful gas of SiH<sub>4</sub> grade was able to be defanged. However, it became clear that the noncombustible and fire-resistant gas with the high decomposition temperature which affects the earth environment of C<sub>2</sub>F<sub>6</sub> grade could hardly carry out decomposing combustion.

[0005] Then, this invention aims at offering the combustion equation damage elimination equipment which can carry out decomposing combustion of the non-flammable gas which the combustion processing of the inflammable harmful gas of SiH<sub>4</sub> grade and the susceptibility-of-substances-to-burn nature harmful gas of NF<sub>3</sub> grade can be carried out below at threshold limit value, and affects the earth environment of C<sub>2</sub>F<sub>6</sub> grade. Moreover, this invention prevents adhesion in the combustion cylinder inside of products of combustion, and aims at the ability to perform combustion processing over long duration. Furthermore, this invention aims at offering the burner which can set to combustion equation damage elimination equipment, can be made to be able to burn and/or decompose various injurious ingredients, and can form the suitable flame for \*\*.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**MEANS**

---

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the combustion equation damage elimination equipment of this invention The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. The 1st configuration Said main burner is the annular solid which formed the V character-like circumferential groove in inner skin. It is characterized by in while forming the circumferential groove of the shape of this V character, for said fuel gas jet nozzle making it a field, for said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion making opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle crossing within a combustion cylinder.

[0007] Moreover, said main burner in damage elimination equipment is the annular solid which has a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion in inner skin, and the 2nd configuration of the combustion equation damage elimination equipment of this invention is characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion.

[0008] The combustion cylinder by which an end is blockaded a lid and other end opening opens the 3rd configuration of this invention for free passage in a cooling dome, The processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. Said main burner It is the annular solid which has a fuel gas jet nozzle and a susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion in inner skin. Said combustion cylinder It is formed by the peripheral wall object arranged in shaft orientations, and said main burner. Rather than this main burner at least a down-stream peripheral wall object In the outer wall of the peripheral wall object which was formed in the double-frame construction which has the wall formed with the porous material, and was formed in this double-frame construction It is characterized by connecting the susceptibility-of-substances-to-burn nature gas supply line for oxidation which supplies the susceptibility-of-substances-to-burn nature gas for processed gas oxidation which blows off in a combustion cylinder through said wall between said double walls.

[0009] Furthermore, in the 3rd configuration of the above, inner skin is formed in a V character-like circumferential groove for said main burner. It is what in while forming the circumferential groove of the shape of this V character said fuel gas jet nozzle makes it a field, said susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion makes opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle intersects within a combustion cylinder, The nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion of said main burner is formed, The peripheral wall object of the upstream is characterized by being the structure where said susceptibility-of-substances-to-burn nature gas for processed gas oxidation is not supplied in a combustion cylinder rather than the main burner of said combustion cylinder. Furthermore, said susceptibility-of-substances-to-burn nature gas for processed gas oxidation has the mixed gas of air, air, and oxygen, or desirable either of oxygen gas, and, as for said fuel gas, it is desirable that they are either a hydrocarbon or hydrogen gas.

[0010] Moreover, the burner for combustion equation damage elimination equipments of this invention The combustion cylinder which an end is blockaded with a lid and other end opening opens for free passage in a cooling dome, The



processed gas installation nozzle which introduces processed gas in a combustion cylinder from said blockaded end, The main burner which forms the flame for burning and/or pyrolyzing said processed gas within said combustion cylinder, It is a suitable burner to use as said main burner of combustion equation damage elimination equipment equipped with the pilot burner which lights this main burner. It is characterized by in while consisting of an annular solid by which the V character-like circumferential groove was formed in inner skin and forming the circumferential groove of the shape of this V character, for a fuel gas jet nozzle making it a field, for the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion making opening to the field of another side, respectively, and the nozzle shaft of both the jet nozzle crossing within said combustion cylinder.

[0011] Furthermore, other configurations of the burner for combustion equation damage elimination equipments are characterized by forming the nozzle penetrant remover supply pipe which supplies a nozzle penetrant remover to the duct which supplies the susceptibility-of-substances-to-burn nature gas for fuel combustion to this susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion while they are equipped with a fuel gas jet nozzle and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion.

[0012]

[Embodiment of the Invention] Hereafter, the example of the 1st gestalt of this invention is explained in more detail based on drawing 1 thru/or drawing 5 . The principle of this invention introduces processed gas soon into an elevated-temperature flame, and are combustion and/or a thing which carries out decomposing combustion.

[0013] The combustion cylinder 3 which an end (upper limit) is blockaded with a lid 1, and other end (lower limit) opening opens for free passage in a cooling dome 2 as the combustion equation damage elimination equipment concerning this example of a gestalt is shown in drawing 1 , The processed gas installation nozzle 4 which is attached in said lid 1 and introduces processed gas (for example, exhaust gas discharged from the manufacturing installation of a semi-conductor or LCD) in the combustion cylinder 3, It has the main burner 5 which forms the flame for burning and/or pyrolyzing processed gas within said combustion cylinder 3, and the pilot burner 6 which it is attached [ pilot burner ] in the core of said lid 1, and lights this main burner 5.

[0014] As said main burner 5 is shown in drawing 2 and drawing 3 , it is the annular solid by which inner skin was formed in the V character-like circumferential groove, and the nozzle shaft of both the jet nozzles 51 and 52 crosses within the combustion cylinder 3 while while forming the circumferential groove of the shape of this V character is turned in the direction of a core of this burner 5 by the fuel gas jet nozzle's 51 making it a field, and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion making opening to the field of another side, respectively. Moreover, although what is necessary is not to restrict especially the path and number of both the jet nozzles 51 and 52, and for a heating value required for combustion of processed gas just to determine them, 72 holes of both jet nozzles 51 and 52 of this example of a gestalt are formed in the hoop direction each by the regular intervals of 5 times. Furthermore, the jet nozzles 51 and 52 are open for free passage, respectively in the annular space sections 53 and 54 formed in this burner 5. In the annular space section 53, the fuel gas supply pipe 55 is open for free passage, and the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion is open for free passage in the annular space section 54, respectively.

[0015] As fuel gas supplied from said fuel gas supply pipe 55, a hydrocarbon like LPG and hydrogen gas are used and the mixed gas of air, air, and oxygen gas or either of oxygen gas is used as susceptibility-of-substances-to-burn nature gas supplied from said susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion. By crossing being taken and spread toward the direction core of a path in the combustion cylinder 3, it mixes efficiently, and the susceptibility-of-substances-to-burn nature gas spouted from the fuel gas and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion which are spouted from said fuel gas jet nozzle 51 lights by the pilot flame of a pilot burner 6, and forms the plane elevated-temperature flame which crosses the inside of the combustion cylinder 3 in the direction of a path. Since processed gas surely crosses a flame by forming such a plane flame, positive combustion and/or a positive pyrolysis can be performed.

[0016] In addition, although the inner skin of a main burner 5 was formed in the V character-like circumferential groove, and the fuel gas jet nozzle 51 and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion were formed in this example of a gestalt so that each nozzle shaft might cross Inner skin is formed in a plane, you may make it form the fuel gas jet nozzle 51 and the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion in parallel with the direction of a burner core, and it is good for the method of outside also as a curved surface of a convex. Thus, by preparing so that fuel gas and the susceptibility-of-substances-to-burn nature gas for fuel combustion may be spouted from a respectively different nozzle, when it is going to obtain a high calory, even if the oxygen density in susceptibility-of-substances-to-burn nature gas is high, a backfire happens and is safe. Moreover, although there is no limit in the use number of a main burner 5, it is desirable to prepare two or more

pieces for the improvement in combustion efficiency.

[0017] The mixed gas of LPG (fuel gas) and air (susceptibility-of-substances-to-burn nature gas) is supplied to said pilot burner 6. Moreover, a pilot burner 6 is set up so that the tip of the pilot flame may reach the installation level location of a main burner 5. That what is necessary is just to be, in this example of a gestalt, four all are prepared by said one or more processed gas installation nozzles 4, although not illustrated.

[0018] Said combustion cylinder 3 is formed by three peripheral wall objects 31, 32, and 33 arranged toward the other end (from the upstream to the downstream) from the end, and the main burners 5 and 5 \*\*\*\*(ed) between the peripheral wall object 31 and 32 and between the peripheral wall object 32 and 33.

[0019] From the main burner 5 of the upstream, the peripheral wall objects 32 and 33 of the downstream As shown in drawing 4 and drawing 5 , it is the porous material with which the susceptibility-of-substances-to-burn nature gas for processed gas oxidation passes a wall 34, for example, the coaxial double-frame construction formed with the sintered metal. In an outer wall 35 In order to make the susceptibility-of-substances-to-burn nature gas for processed gas oxidation blow off in the combustion cylinder 3 through a wall 34, the susceptibility-of-substances-to-burn nature gas supply line 37 for oxidation for supplying this susceptibility-of-substances-to-burn nature gas to 36 between said double walls is connected. Thus, adhesion in the wall 34 of SiO<sub>2</sub> powder which the susceptibility-of-substances-to-burn nature gas for processed gas oxidation used as the oxidation gas combustion of SiH<sub>4</sub> and for the decomposing combustion of C<sub>2</sub>F<sub>6</sub> blows off through this wall 34, for example, is generated by combustion of SiH<sub>4</sub> is prevented by forming the wall 34 of the peripheral wall objects 32 and 33 with a porous material.

[0020] Moreover, when becoming beyond the heat-resistant temperature of the porous material which the temperature of a wall 31 is using for a wall 34 by combustion of a main burner 5, you may also include the heat-insulating element 7 which consists of heat-resistant porous materials, such as ceramic form, like this example of a gestalt inside a wall 34. As for said susceptibility-of-substances-to-burn nature gas for processed gas oxidation, air, air and the mixed gas of oxygen gas, or either of oxygen gas is used. In addition, the baffle for the susceptibility-of-substances-to-burn nature gaseous diffusion for processed gas oxidation in 38 and 39 are the ports for thermometries in the combustion cylinder 3.

[0021] Since the peripheral wall object 31 between the main burners 5 of the upstream which adjoins said lid 1 and this lid 1 most is arranged in the location before the processed gas introduced in the combustion cylinder 3 touches the flame of a main burner 5, there is little growth of SiO<sub>2</sub> powder and there is also little adhesion of the powder to an internal surface, for example. For this reason, the peripheral wall object 31 can be made into the structure where said susceptibility-of-substances-to-burn nature gas for processed gas oxidation is not supplied in the combustion cylinder 3. That is, wall 34a may be the double-frame construction formed with the usual metal like single wall structure or this example of a gestalt.

[0022] In addition, if oxygen gas is contained in processed gas, for example, it is contained in processed gas for example, SiH<sub>4</sub> burns within the processed gas installation nozzle 4, and SiO<sub>2</sub> powder carries out accretion at the tip of this nozzle 4. In such a case, you may make it prevent adhesion of SiO<sub>2</sub> powder to the tip of a nozzle 4 by constituting wall 34a from porous materials, such as a sintered metal, supplying inert gas to 36 between double walls a, and making inert gas blow off from porous wall 34a in the combustion cylinder 3.

[0023] The other end of the combustion cylinder 3 is connected to up opening of the cooling room 21 of the shape of a cylinder like object with base of a cooling dome 2. This cooling dome 2 had said cooling room 21, the coolant gas installation tubing 22 linked to the peripheral wall of this cooling room 21, and the processed gas exhaust pipe 23 connected with this introductory tubing 22 at the peripheral wall which counters, and this exhaust pipe 23 has connected for example, processed gas to a scrubber (not shown), such as carrying out washing processing. Said combustion cylinder 3 is formed so that the coolant gas flow direction of a cooling dome 2 and the shaft orientations may cross at right angles.

[0024] And the processed gas introduced in the combustion cylinder 3 By the suction effect of the blower (not shown) connected to the processed gas exhaust pipe 23 side Flow the inside of the combustion cylinder 3 toward a cooling dome 2, and the plane elevated-temperature flame of a main burner 5 is passed in the meantime. It burns and/or pyrolyzes, and the cooling air which flowed in the cooling room 21 from the coolant gas installation tubing 22 by said suction effect is joined, it is cooled, and the injurious ingredient in processed gas is discharged with cooling air from the processed gas exhaust pipe 23.

[0025] Drawing 6 is drawing of longitudinal section of combustion equation damage elimination equipment about the example of the 2nd gestalt of this invention. In addition, in the following explanation, the same sign is given to the same component as the component of said example of the 1st gestalt, and detailed explanation is omitted.

[0026] The combustion cylinder 3 shown in this example of a gestalt is formed like said example of a gestalt with two

main burners 5 and 5 and three peripheral wall objects 38 established so that this main burner 5 might be pinched. Each peripheral wall object 38 is formed in the interior by the double-frame construction which has gas-passageway 38a, and the coolant gas installation tubing 39 and a coolant gas delivery tube (not shown) are connected to the peripheral wall outside-of-the-body wall, respectively. He is trying for this peripheral wall object 38 to prevent the temperature rise of a peripheral wall inside-of-the-body wall by introducing gas, such as air, into gas-passageway 38a from the coolant gas installation tubing 39, and deriving from a coolant gas delivery tube.

[0027] Moreover, use said susceptibility-of-substances-to-burn nature gas as coolant gas, it is introduced into gas-passageway 38a, and a temperature up is carried out by heat exchange with a peripheral wall inside-of-the-body wall. By supplying the hot coolant gas drawn from the coolant gas delivery tube to said susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion, and making it blow off from the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion of said main burner 5 The flame temperature of a main burner 5 can be raised and more effective combustion damage elimination can be performed.

[0028] Furthermore, in the main burner 5 shown in this example of a gestalt, the nozzle penetrant remover supply pipe 57 which supplies a nozzle penetrant remover to said susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion which supplies susceptibility-of-substances-to-burn nature gas is connected to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion. A nozzle penetrant remover is for flushing the powder of SiO<sub>2</sub> grade adhering to the nozzle section of a main burner 5, for example, can choose liquids, such as water and an alkali water solution, according to the description of an affix.

[0029] Thus, even if powder adheres to the inner skin and the nozzle point of a main burner 5 in operation of long duration by connecting the nozzle penetrant remover supply pipe 57 By closing valve 56V of the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion, opening valve 57V of the nozzle penetrant remover supply pipe 57, and supplying a nozzle penetrant remover to the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion Washing removal of the powder adhering to the inner skin of a main burner 5 can be carried out without disassembling the combustion cylinder 3. Thereby, the cost which maintenance takes can be reduced sharply. Moreover, it is easily applicable also to existing combustion equation damage elimination equipment only by extension of piping.

[0030] After washing by the nozzle penetrant remover, Valves 56V and 57V are switched. Susceptibility-of-substances-to-burn nature gas to the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion In addition, a sink, Although what is necessary is just to discharge a nozzle penetrant remover from the inside of the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion, when expensive gas like oxygen gas as susceptibility-of-substances-to-burn nature gas is being used The purge gas installation tubing 58 which prepared valve 58V is connected to the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion. Gas cheap as purge gas, for example, the compressed air etc., from this purge gas installation tubing 58 by the high-speed style Or by supplying at an elevated temperature, a nozzle penetrant remover can be purged economically and efficiently. Moreover, it can also be made to blow off, where a penetrant remover, air, etc. are mixed.

[0031] Moreover, although it is possible also for connecting with the fuel gas supply pipe 55, when safety is taken into consideration, it is desirable [ such a nozzle penetrant remover supply pipe ] to connect with the susceptibility-of-substances-to-burn nature gas supply line 56 for fuel combustion as mentioned above.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**EXAMPLE**

---

[Example] The combustion equation damage elimination equipment of a configuration of being shown in example 1 drawing 1 -5 was used. A main burner 5 is a product made from stainless steel with the outer diameter of 350mm, a bore [ of 155mm ], and a thickness of 16mm, and is carrying out the shape of an anchor ring. the aperture of the fuel gas jet nozzle 51 of this burner 5 -- 1.6mm -- it is -- the aperture of the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion -- 2.2mm -- it is -- a hole -- numbers are 72 holes each. Moreover, the nozzle shaft of both the jet nozzles 51 and 52 leans 5 times to the horizontal plane, respectively so that the include angle of the V character slot of a ring main jet side may cross within the combustion cylinder 3 at 40 degrees.

[0033] It is the double-frame construction to which the peripheral wall objects 32 and 33 of the downstream used the sintered metal made from stainless steel with an outer diameter [ of 200mm ], and a thickness of 3mm for wall 3e, and used stainless steel with an outer diameter of 267.4mm for 3f of outer walls from the main burner of the upstream, and the die length of each peripheral wall objects 32 and 33 is 84mm. Moreover, inside the sintering metal wall 34, ceramic form (Bridgestone Make) with an outer diameter [ of 200mm ] and a bore of 150mm was included as a heat-insulating element 7. The peripheral wall object 31 located in the upstream from the main burner 5 of the upstream is the double-frame construction which used the outer diameter of 267.4mm, and 216.3mm stainless steel for outer wall and wall 34a, respectively.

[0034] The outer diameter of 267.4mm, the bore of 260.6mm, height of 170mm, the coolant gas installation tubing 22, and the processed gas exhaust pipe 23 were 110.1mm in the outer diameter of 114.3mm, and bore, the flow rate of the cooling air of a cooling dome 2 was set into 16000l./m, and the cooling room 21 of a cooling dome 2 set the rate of flow to per second 28m.

[0035] The pilot burner 6 used PP-2-L of Naigai Co., Ltd., and LPG (fuel gas) 3l. [ /m ] and air (susceptibility-of-substances-to-burn nature gas for fuel combustion) 62.5l./m carried out mixed-gas supply, and it lit this pilot burner with the attached spark rod.

[0036] While the processed gas installation nozzle 4 supplies N2 [ 50l./m ], N2 [ i.e., ] of 200l./m of sum totals, to each nozzle 4 and introduces them into it in the combustion cylinder 3, using a thing with an outer diameter of 42.7mm four Air (susceptibility-of-substances-to-burn nature gas for processed gas [ powder antisticking-cum-] oxidation to a wall) 300l./m is supplied to 36 between the double walls of the peripheral wall objects 32 and 33 by reference condition (0-degree-C, one atmospheric pressure) conversion, respectively. Alike, respectively two main burners 5 and 5 after carrying out aeration into the combustion cylinder 3 through a wall 36 and a heat-insulating element 7 -- with LPG (fuel gas) 10l./m The mixed gas (susceptibility-of-substances-to-burn nature gas for fuel combustion) which consists of air 133l. [ /m ] and oxygen 14l./m was supplied, respectively, and was lit by the pilot burner 6.

[0037] Then, when N2 of the processed gas installation nozzle 4 was changed to N2 gas which contains SiH4 2%, was supplied every 50l./m a total of 200l. and carried out continuous-combustion processing for 8 hours, SiH4 concentration in the other end outlet section of the combustion cylinder 3 was always below threshold limit value (5 ppm). Moreover, after the combustion processing halt, when the overhaul of the combustion cylinder 3 was carried out, adhesion of the processed gas installation nozzle section and SiO2 powder to a wall was not seen.

[0038] In the same equipment as example 2 example 1, and the same utility conditions, when introducing 200l./m of every 50l./m sum totals and carrying out combustion processing of the N2 gas which contains NF3 2% as processed gas, NF3 concentration in the outlet section of the combustion cylinder 3 was below threshold limit value (10 ppm).

[0039] In the same equipment as example 3 example 1, and the same utility conditions, when introducing 200l./m of every 50l./m sum totals and carrying out decomposing combustion processing of the N2 gas which contains C2F6 2% as processed gas, the cracking severity in this equipment was 97% or more.

[0040] Except having connected the nozzle penetrant remover supply pipe 57 to the susceptibility-of-substances-to-burn

nature gas supply line 56 for example 4 fuel combustion, it was the same equipment as an example 1, and conditions, and after performing combustion processing of  $\text{SiH}_4$  continuously for 168 hours, when the interior of the combustion cylinder 3 was checked,  $\text{SiO}_2$  powder had adhered to the nozzle point of a main burner 5 by the thickness of about 5mm. Tap water was supplied from the nozzle penetrant remover supply pipe 57 in the condition of this as, and it was made to blow off from the susceptibility-of-substances-to-burn nature blow-of-gas nozzle 52 for fuel combustion for 10 minutes. Consequently,  $\text{SiO}_2$  powder of a nozzle point was removable.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is the important section vertical section front view showing the example of the 1st gestalt of the combustion equation damage elimination equipment of this invention.

[Drawing 2] the example of 1 gestalt of the main burner of the combustion equation damage elimination equipment of drawing 1 is shown -- it is a cross-section top view a part.

[Drawing 3] It is the cross-section front view of the main burner of drawing 2 .

[Drawing 4] the example of 1 gestalt of the peripheral wall object which forms the combustion cylinder of the combustion equation damage elimination equipment of drawing 1 is shown -- it is a cross-section top view a part.

[Drawing 5] It is the cross-section front view of the peripheral wall object of drawing 4 .

[Drawing 6] It is the important section vertical section front view showing the example of the 2nd gestalt of the combustion equation damage elimination equipment of this invention.

[Description of Notations]

1 [ -- A wall, 35 / -- An outer wall, 37 / -- The susceptibility-of-substances-to-burn nature gas supply line for oxidization, 4 / -- A processed gas installation nozzle, 5 / -- A main burner, 51 / -- A fuel gas jet nozzle, 52 / -- The susceptibility-of-substances-to-burn nature blow-of-gas nozzle for fuel combustion, 55 / -- A fuel gas supply pipe, 56 / - The susceptibility-of-substances-to-burn nature gas supply line for fuel combustion,, 57 / -- nozzle penetrant remover supply pipe, 6 / -- A pilot burner, 7 / -- Heat-insulating element ] -- A lid, 2 -- cooling dome, 3 -- A combustion cylinder, 31, 32, 33 -- 34 A peripheral wall object, 34a

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

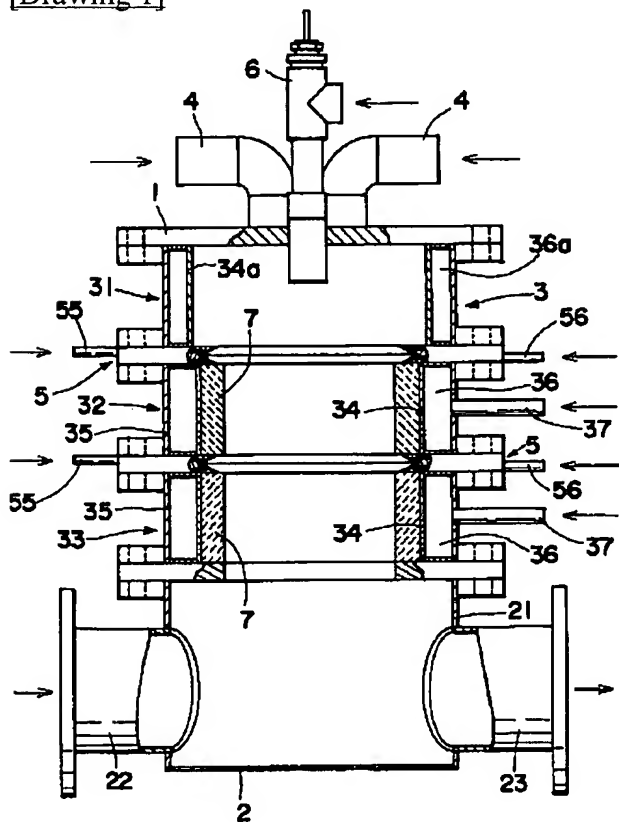
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

DRAWINGS

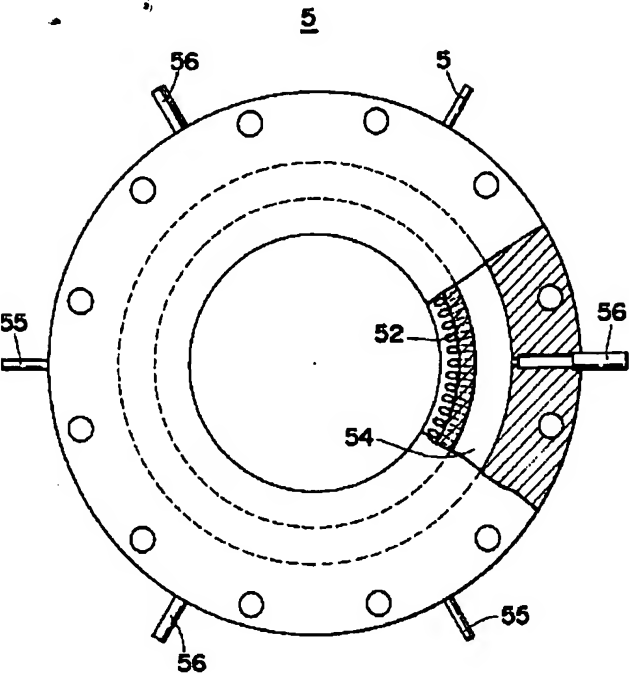
---

[Drawing 1]

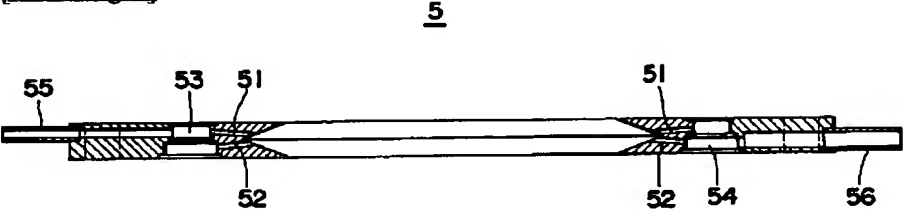


[Drawing 2]

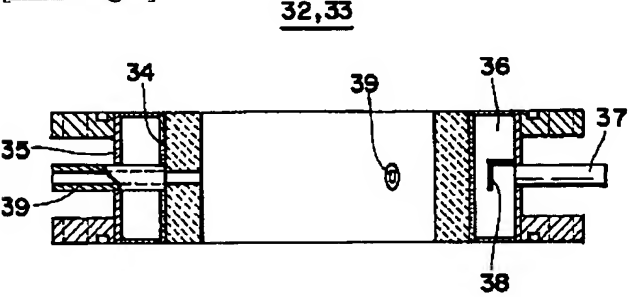




[Drawing 3]

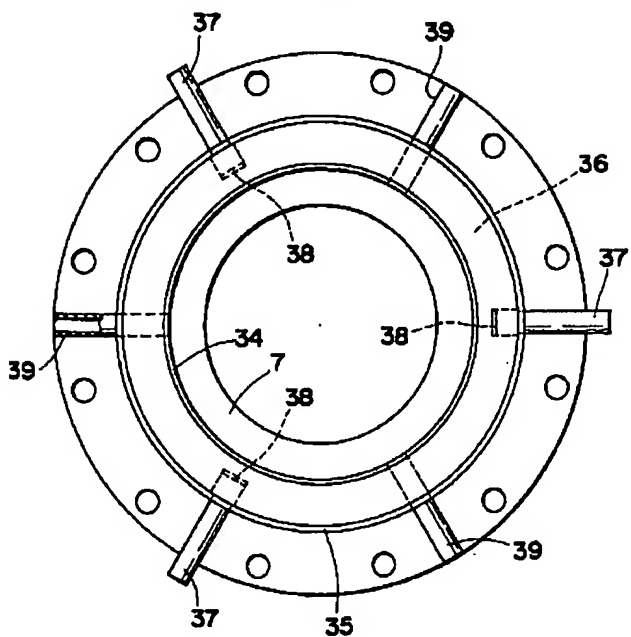


[Drawing 5]

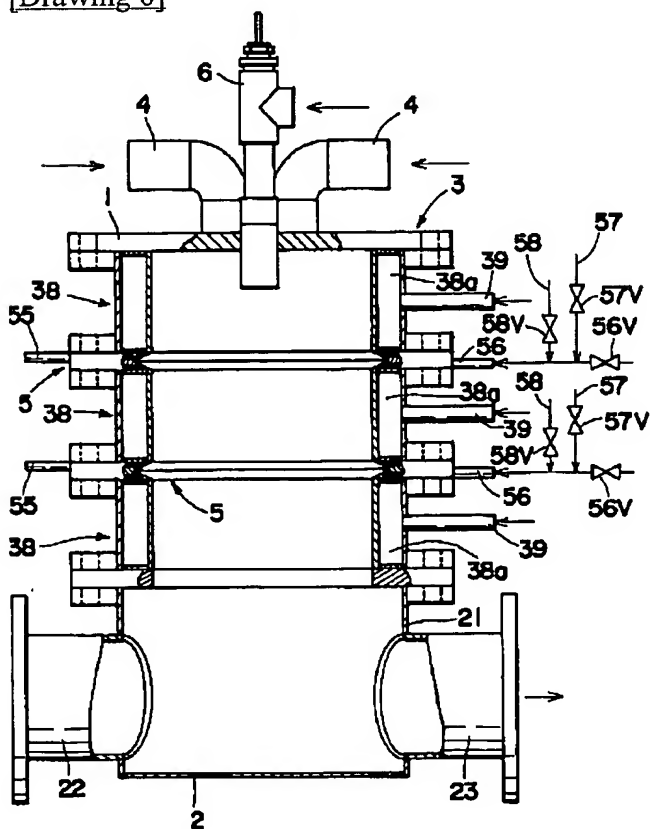


[Drawing 4]

32,33



[Drawing 6]



[Translation done.]